

FY14 Research & Development Summaries & Staff Recommendations – May 2014

The following eight new R&D proposals were submitted March 15th and will be discussed at the May 7th Committee meeting for decisions to send to the vetting process. The R&D program has a current available balance of more than \$29 million.

Req #	Organization Name	Project Title	Request Amount	Staff recommendation
2868	Halifax County IDA	Design, Development, and Manufacturing of a New High Performance Vehicle and Creation of Composite Manufacturing Capabilities in Southern Virginia	\$838,786	vetting
2871	Region 2000 Research Institute	Spectrum Management Research Testbed (SMART)	\$1,543,007	vetting
2867	Scott County Economic Development Authority	PICC Line Security and Quality Control Device	\$750,000	vetting
2869	Southwest Virginia Higher Education Center Foundation	Premium Efficient Electric Field Motors	\$2,000,000	vetting
2870	Southwest Virginia Higher Education Center Foundation	Regenerative Heat Retaining Element for natural gas pipeline compression engines	\$2,000,000	vetting
2872	University of Virginia	UVa-Wise / Micronic Technologies Water Field Pilot Program to Support Commercialization	\$1,995,145	vetting
2866	Virginia State University	Pilot Sweet Sorghum-to-Syrup Infrastructure for Southside Virginia	\$809,092	no further action
2865	VTT, LLC	Vehicle Modeling & Simulation Center Addition to the National Tire Research Center	\$3,000,000	vetting

Total (8 requests)

\$12,936,030

Halifax County IDA

Design, Development, and Manufacturing of a New High Performance Vehicle and Creation of Composite Manufacturing Capabilities in Southern Virginia (#2868)

\$838,786 requested

Executive summary provided by applicant: TMI AutoTech, a long-standing company in the footprint, will design and prototype a high performance vehicle geared to amateur use, which will be named the TMI_SNIPER. TMI will partner with existing TIC funded research and development centers and international automotive companies to develop the TMI_SNIPER prototype from the ground up. TMI_SNIPER requires advanced materials, such as Fiber reinforced Composite Materials, a manufacturing capability that is not currently available in our region. This project will create a new initiative to bring composite manufacturing capabilities to our region. TMI_SNIPER will be completely manufactured in the Tobacco region, creating approximately 18 skilled jobs.

Research and Development Opportunity

The engineering required to develop the TMI_SNIPER will require the collaboration of various organizations within the footprint to assist with modeling, simulation, prototyping, and testing. Partners include: Southern Virginia Product Advancement Center's Modeling and Simulation Center and National Center for Coatings; the National Tire Research Center; Southern Virginia Vehicle Motion Labs; the Southern Virginia Higher Education Center; Regional Center for Advanced Technology and Training; and the Virginia International Raceway. Other partners outside the region include Honda Performance Development and other automobile supply companies. In addition, a new composite manufacturing center will provide the materials for the TMI_SNIPER and future products.

Proposed Research and Development

The engineering required to develop the TMI_SNIPER will require the collaboration of various organizations within the footprint to assist with modeling, simulation, prototyping, and testing. Partners include: Southern Virginia Product Advancement Center's Modeling and Simulation Center and National Center for Coatings; the National Tire Research Center; Southern Virginia Vehicle Motion Labs; the Southern Virginia Higher Education Center; Regional Center for Advanced Technology and Training; and the Virginia International Raceway. Other partners outside the region include Honda Performance Development and other automobile supply companies. In addition, a new composite manufacturing center will provide the materials for the TMI_SNIPER and future products.

Commercial Potential

The TMI_SNIPER will be exclusively manufactured in the footprint and sold globally with a network of international distributors. The 5 year goal is to manufacture and sell 100 TMI_SNIPERs at a starting price point of \$135,000. Customer market segments would include club racers, track-day enthusiasts, school car programs, and promotional vehicles. An injection of \$475,000 in private capital and 19 skilled jobs into the region with an annual average salary of \$30,400 by year 3, is anticipated. These jobs include CNC machinists, assembly technicians, mechanical engineers, a project manager, a lead designer, precision welders, fabricators, composite manufacturing technicians, and administrators.

Intellectual Foundation

There are no current patents associated with this project, however the design and engineering data for the vehicle are considered the intellectual property of the company. TMI Autotech will use its prior experience with intellectual property management to strategically trademark and patent aspects of the vehicle where those protections are valuable to TMI's competitive position in the marketplace. IP management will be influenced by prior art, competitors, and country specific intellectual property laws.

Staff comments and recommendation: The proposal seeks funds for cost-sharing of design and fabrication personnel, supplies/materials to construct three beta test cars, testing services, and improvements to the C-CARE center (\$100k) to prepare 1,100 sq ft to be leased to TMI. Proposed matching funds will be used to acquire equipment (\$495k) and conduct marketing/management/selling costs (\$96k). Overall matching funds are shown as \$985k, and the project budget depends heavily on a private investor(s) committing \$750k (“borrowing” those funds is mentioned) and TMI reports it has met both with private investors and banks regarding that private financing. Nineteen jobs are projected at full manufacturing operation. The applicants propose that any revenues be used to pay off company debt and further develop the composite facility. The proposal provides evidence of TMI’s industry experience with the Aerial Atom race vehicle, strong partnerships with (among several others) testing facilities in the region including SoVa Motion’s 8 post shaker and National Tire Research Center, the modelling/simulation and C-CARE coatings research facilities in South Boston, DCC’s RCATT center for prototype development, and with international performance racing developers including Honda’s drive train division. The applicant’s request that project expenses incurred after the application due date of March 15 be considered as eligible match, which seems a reasonable request and demonstrates the project team’s commitment to rapid implementation of the project. There are little if any project costs that will be spent outside the region from either TICR or matching funds, although a portion of matching funds is for long-lived equipment that is not entirely dedicated to this project (HIDA and TMI are preparing a response on this issue). While commitment of the required matching funds is being pursued **Staff recommends forwarding this proposal to the vetting process.**

Region 2000 Research Institute

Spectrum Management Research Testbed (SMART) (#2871)

\$1,543,007 requested

Executive summary provided by applicant: Americans are using more and more wireless devices and global mobile data volumes are more than doubling every year for the past four years. The result is a growing demand for access to regions of the wireless spectrum now held by government agencies or private entities for other purposes. The preferred way to increase capacity is to leverage new technologies that enable larger blocks of spectrum to be shared. Our goal is to create a new economic center of activity in southwest and southern Virginia around the emerging area of intelligent spectrum access.

Research and Development Opportunity

Both government and industry have a critical need for a mobile large-scale testbed for spectrum sharing. Incumbent government users need to develop confidence that their systems will work without interference. Secondary users (industry) need to have a well-defined and streamlined process for testing and approval of new devices. Therefore, the U.S. needs to develop the ability to support rapid experimentation with new technology, collect operational data, establish the dependability of new technology, establish dependability of the management techniques and architecture and study emergent behavior that cannot be understood through analysis on anything simpler than the whole system.

Proposed Research and Development

This center would be focused on researching, developing and deploying low-cost broadband spectrum sharing technologies. Understanding the limitations for the increasingly cluttered RF environments will be incredibly important in planning and deploying future wireless systems. Given these facts, it is anticipated that proper spectrum management in these environments will hasten the deployment of future wireless devices and reduce the operating costs of managing a large number of these devices.

Commercial Potential

One of the most critical elements in a technology-based economy is the strength of its R&D infrastructure. Research generates new knowledge that forms the basis for creating new firms and products. These centers both attract and produce the technically educated workforce needed by technologically advanced companies. Finally, these centers generate intellectual property that can lead to the creation of new companies. A formal Economic Impact Analysis for this initiative will be provided prior to award to describe the economic impact of the development and operation of the center, as well as the spillover effects of the applied research.

Intellectual Foundation

Virginia Tech Intellectual Properties has a portfolio of related IP available for licensing and new business start-up. Recent examples developed with the CAER include "Dynamic Spectrum Access and TRANSEC Through a Repeater and Frequency Translator" (VTIP 14-056, 10/22/13) and "Cognitive Reconfigurable RF Technology" (VTIP 14-035, 9/16/13). Examples of other cognitive radio products that we plan to develop include technologies that will use spectrum more efficiently by intelligently avoiding interference. These innovative spectrum access technologies will constitute key intellectual property key to national competitiveness for 4G and 5G wireless systems, as well as support economic growth in the region.

Staff comments and recommendation: Matching funds will come from a federal EDA grant proposal to be submitted in June, with an anticipated September funding decision (the latter would be relatively concurrent with a TICR funding decision). The proposal will build a robust research capacity at CAER in much the same manner as the National Tire Research Center in a subsequent request in this cycle. Also like NTRC, the CAER SMART testbed is expected to serve "a wide range of government and industry users" and not one single defined private beneficiary or process, although it can be argued the focus on "researching, developing and deploying low-cost broadband spectrum sharing technologies" (as opposed to innumerable narrow bands of spectrum that are licensed for single users) may constitute a primary defined research task. The proposal states this concept of spectrum sharing has been recommended as a long term strategic solution by the President's Council of Advisers on Science & Technology, and an attached letter from Alcatel/Lucent (home of Bell Labs) reinforces that strategic direction. Proof of concept was reportedly demonstrated at Wallops Island in Summer 2013 by Wireless@VT and CAER. The proposal specifically seeks funds to construct a base center at CAER (master control radio and servers to process data) as well as a fleet of four test service vehicles with equipment shelters, power, antenna masts, backhaul equipment etc. that can be deployed to sites where wireless systems can be tested for clients including military, maritime, industry, public safety, agriculture, healthcare etc. TICR funds would primarily be used to contract with VA Tech's Wireless@VT center and other research partners (\$885k), hire CAER project staff (\$300k), and equipment/supplies/materials (\$318k). Matching funds would come from an equal amount of federal EDA grants funds to be applied for in June, with an anticipated September 2014 funding decision. A business plan is provided, and purports that the SMART program will be self-sustaining business unit of CAER after this requested start-up funding is provided. Five jobs would be created (based on an assumption of two customer contracts per quarter at full operation), with private capital investment of \$500,000 (anticipated revenues to be reinvested in CAER's SMART equipment and facility). Wireless technology is one of two industry-led technology transfer missions for CAER since its creation, and the proposal's intent to develop technologies that can be commercialized by area companies aligns not only with the CAER mission but with the region's cluster of wireless companies and engineers that remain from the former Ericsson operation in Lynchburg. An economic impact analysis provided for CAER to quantify the expected benefits to the region from having such leading edge testbed capabilities in place. The anticipated economic development outcomes that can be directly attributed to the project are somewhat minimal (five jobs), but this is an opportunity to generate a substantial ongoing revenue stream to support CAER in the future. CAER acknowledges and TICR Staff notes that a significant portion of the \$885k of contracted

funds will pay for work conducted by Wireless@VT in Blacksburg, which is an issue relative to policy that TICR funds be used for research conducted in the tobacco region. Funding of this proposal would be contingent on success securing the EDA matching funds, and in the meantime **Staff recommends forwarding this proposal to the vetting process.**

Scott County Economic Development Authority
PICC Line Security and Quality Control Device (#2867)
\$750,000 requested

Executive summary provided by applicant: The present general inventive concept relates to systems and methods of securing a Peripherally Inserted Central Catheter (PICC) against tampering, and allowing for a secure chain of command interface during a medical procedure, and more particularly, a PICC line security cover, securing the PICC line tubing, and a lockable PICC line access port securing device all of which offer tamper evident detection.

Research and Development Opportunity

America is experiencing epidemic levels of drug addiction fueled by easy access to stronger and highly addictive pain medication. This creates great stress and costs on the Medical system. Current PICC lines are not secure. IV drug users can develop threatening infections requiring antibiotics so they are not suited for general outpatient Treatment. IV drug users use these PICC lines to inject drugs. Supervision explodes costs and strains facilities. Access to these PICC lines is not controlled or tamper-resistant allowing unauthorized access. A PICC line security system is needed to secure against patient tampering.

Proposed Research and Development

This project will result in product development that will establish chain of command, prevent patient access to PICC line site and provide detection of tampering. Developed product(s) will consist of; lockable endcap, braided puncture resistant tube, covered puncture resistant compartment, tamper evident strap and multiple handed buckle operation with chain of command tracking.

Commercial Potential

This R&D project is intended to feed product development of secure PICC line products. The company will be domesticated in Duffield VA for this R&D phase to create jobs and will grow with the product development phase. Our intent is to design, produce, market, and sell these products to the medical industry from the Duffield facility creating additional jobs. This project will benefit the Tobacco Region communities within the Commonwealth.

Intellectual Foundation

Provisional Patent filed May 2, 2013 Application # 61818451, Catheter Security Device, name on filing: Jameson Arnott. We are currently filing the Non-Provisional under the names: Jameson Arnott, Henry Derrick and Fred Pinney. A valuation was performed on the Provisional Patent (Intellectual property valuation) by TYNAX out of Scotts Valley, CA on 01/16/2014. They estimated a value of \$1,484,982.44 as of January 2014. This valuation was based on the licensing potential for the patent and cross-checked against prices experienced in the patent trading market.

Staff comments and recommendation: Funds are requested for use through year-end 2017 on behalf of ADP Biosciences LLC, (where incorporated and by who) a "newly-formed partnership" which would use TICR funds to "research, develop, troubleshoot, test and construct" the prototype secure PICC that will be tamper-proof to drug abusers. Matching funds consist entirely of IP that was developed prior to this

application and has been independently-valued initially at nearly \$1.5 million, but later revised to \$865k. That IP will form the scientific foundation for the prototype, and a provisional patent was submitted in May 2013 by a collaborator to the company principals. Consequently, no matching funds will be spent concurrently with the requested TICR funds, which is contrary to R&D program guidelines. The company anticipates production of the PICC at the Crooked Road Tech Center in Duffield beginning with 17 employees and more than 150,000 units sold in 2017, growing to 55 employees and 660,000 units sold in 2019. TICR funds are requested to pay the two company principals (\$270k), to contract with outside expertise for engineering, troubleshooting and quality assurance (\$210k), for supplies/materials to have the prototypes "designed and fabricated by third party providers" (\$225k), continuous operating expenses (\$40k), and equipment (\$5k). It is not entirely clear what work to design and test the prototype will be conducted within the tobacco region. The proposal does not offer to return any project revenues to the Commission. While neither company principal appears to have a medical science background a chief technology officer with biosciences experience has joined the team (Mr. Arnott, a patent co-holder), and it's reported that the founder of the Holston Medical Group has joined as an advisor. The company's business plan indicates it will contract for fabrication and conduct final assembly in Duffield in 2017-18, with full production/assembly taking place there beginning in 2019. Three positions are budgeted in the research phase, with 36 in manufacturing and 12 in sales/marketing by 2019. Capital expenditure will be modest, with a \$300,000 expense expected for production equipment, and the absence of concurrent matching funds is an issue the EDA and company are working to address. Despite the latter two issues, this appears to be a significant medical device opportunity based on established IP, with significant potential job creation for the tobacco region. Although concurrent matching funds are still being identified, **Staff recommends forwarding this proposal to the vetting process.**

Southwest Virginia Higher Education Center Foundation

Premium Efficient Electric Field Motors (#2869)

\$2,000,000 requested

Executive summary provided by applicant: The electric motor and generator market is \$90B globally with yearly growth of about 5%. Electric motors consume 50% of electrical energy produced in the US. However, standard magnetic induction motors have many drawbacks, including manufacturing cost and low operating efficiencies. Electric Force Motors (EFM) has a fundamentally new electric motor and generator technology based on its Electric Field Technology. EFM's motors are extremely efficient, thus lowering operating costs. In addition, manufacturing of EFM's electric field motors can be completely automated, thus lowering purchase costs compared to magnetic induction motors. EFM seeks funding to develop manufacturing for its new motors.

Research and Development Opportunity

Modern motor manufacturers are unable to economically produce electric motors at a cost or the operating efficiencies demanded by the market and increasingly stringent environmental regulations. EFM's electric field motors have immense advantages over the induction motors standard in the market today. EFM is seeking funding to support the R&D efforts to refine existing designs and manufacturing processes to optimize the processes, and to meet standards set by Federal Communication Commission (FCC), Underwriter's Laboratory (UL), European Community Quality Mark (European version of UL) and Canadian Standards Association (Canadian version of UL).

Proposed Research and Development

Working knowledge of global manufacturing standards and certifications are a highly specialized skill set. EFM will use TIC funding to develop this knowledge and applicability to efficient manufacturing operations. As explained in detail in the Business Plan, EFM's prototype is largely complete, but the mass manufacturing process must be custom-developed (with equipment repurposed for EFM's specific needs) before EFM can have the desired impact on the Tobacco Region. This knowledge and manufacturing experience will easily transfer to other manufacturers in the Tobacco Region and will fuel the company's future product development.

Commercial Potential

To move into commercial manufacturing, EFM will need a skilled labor force, environmentally controlled facilities and an array of robotic and automated machinery. The labor force and necessary manufacturing equipment will be developed in the Tobacco Region. EFM's primary market will be industrial, focusing on HVAC OEMs. Initial applications will require small integral horsepower motors (1-15HP). This commercial HVAC market represents 13% of the motor market and is an \$8B market annually. HVAC applications include ventilators, direct drive and belted fans, exhaust fans, unit heaters, air conditioning units, and commercial refrigeration condensers.

Intellectual Foundation

The fundamental theories behind EFM's technology have been known for over 100 years, but the materials needed to turn the theory into cost-effective reality have only recently become available. Thus, EFM's IP is based on the unique combination of materials although claims covering power rating, design and controls have also been submitted. In this manner, EFM is creating a broad fence around the core IP, with plans to then expand around special applications and performance metrics that are currently under development.

Staff comments and recommendation: The private beneficiary, EFM, was formed in December 2011 and is currently conducting prototype development and testing at the Dominion Resources Innovation Center in Ashland VA, where it benefits from a strong technical and legal resources support network that constitutes the company's advisory board. A letter of support is provided by Dominion Power's Alternative Energy Solutions division. EFM proposes establishing an operation in Emporia/Greenville, and the County staff has provided a letter stating that it is working with the company to identify space to include a clean room and high voltage testing facility. The required matching funds are not yet in hand, and are part of a private Series A fundraising effort planned for the June-August 2013 timeframe to obtain up to \$5M for operational start-up. The proposal indicates ten positions in the R&D phase (within 3 years) and 40 positions in manufacturing phases (by year 5) that company's business plan indicates is still being designed. Operational forecasts for costs and revenues, staffing etc are not provided in the business plan, but were provided in supplemental information. The SVHEC Foundation states that rather than passing through grant funds to the company it intends to provide them as an investment in the company with rights to a return on investment paid out of the company's profit distributions. Furthermore the Foundation offers to share some or all of those returns with the TICR if the Commission so chooses. The company's path appears to be strongly supported by Dominion and its industry partners, and while matching funds are being raised **Staff recommends forwarding this proposal to the vetting process.**

Southwest Virginia Higher Education Center Foundation

Regenerative Heat Retaining Element for natural gas pipeline compression engines (#2870)

\$2,000,000 requested

Executive summary provided by applicant: Radical Combustion Technologies NG ("RCT") has a proprietary technology called Regenerative Heat Retaining Element ("RHRE"). RCT proposes to scale up its RHRE technology for retrofitting the very large, old engines used by the natural gas industry to compress natural gas for transport through the interstate pipeline system. The proprietary RHRE technology has been validated in rigorous proof-of-concept and smaller-size scale-up tests. RCT's testing to date demonstrates RHRE technology solves the natural gas pipeline industry's pressing need to meet current and impending emissions requirements.

Research and Development Opportunity

Natural gas pipeline compression engines are extremely large (14-20 inch cylinder bore sizes; 1,000 HP-14,000 HP). They were last built in the mid-1990s, have an average age of 50 years, and are known as "Legacy" engines. They are fuel efficient but are environmentally "dirty" under current and coming standards. In 2003 the pipeline industry launched a program to solve the Legacy engine emissions problem. By 2011 major retrofit enhancements were available at a cost of ~\$2,000/HP, compared to \$4,000/HP for full replacement. RCT projects its RHRE technology can meet industry emissions goals for a major reduction in retrofit costs.

Proposed Research and Development

RCT will build and operate a Tobacco Region facility for scaling the RHRE technology to Legacy engine sizes. RCT already has completed bench and RHRE scale-up tests on an 8.5-inch bore engine that demonstrate proof-of-concept in gaseous fuels, as well as computer simulations on Legacy sizes. Prior to project start date RCT will have conducted further experimental tests and more comprehensive simulation analyses on the 8.5-inch bore engine. Under the proposed TIC-funded project, RCT will test the RHRE on a Legacy-scale (15-inch bore) natural gas engine in its Tobacco Region facility. Then RCT will undertake field tests with beta customers.

Commercial Potential

There are ~5,600 Legacy engines generating 10,000,000 HP domestically. This represents a \$1.5 to \$2.0 billion market opportunity for RCT, plus a massive savings for its customers. The prospective customers (e.g., Kinder Morgan, Dominion Resources, Spectra, Williams Pipeline) are large, few in number, readily identified, and motivated to find a solution to emissions issues. Product line extensions RCT already has in development represent additional \$3.5 billion market opportunity with natural gas transmission pipelines in the U.S. alone. Adjacent stationary and mobile engine vertical markets include maritime, locomotive, off-road, industrial, general aviation piston-fired engines and, ultimately, automotive.

Intellectual Foundation

RCT controls the RHRE technology and related intellectual property and know-how in the stationary natural gas engine market. RCT has an option to extend its rights to other market segments. Some of the RHRE technology already is patented and some is patent pending. The attachments to this Application, including the Confidential Business Plan, contain additional details.

Staff comments and recommendation: The proposal requests a majority of funds (88% or \$1.75M) for personnel ("up to 15" positions) to conduct R&D at a leased test lab in Tazewell County. In the overall project budget, TICR is asked to pay 83% of personnel while the private company proposes to pay 86% (\$1.3M) for contractual expenses, including testing at Virginia Tech, and 89% of supplies/materials.

Matching funds include a commitment of \$1.5M from the Tazewell IDA for property (a 14,000 sq. ft. facility in a building to be leased from the IDA) and production equipment, to be further matched with private funds of \$2.3M that have not yet been raised through a planned Series A private equity financing round. The Tazewell IDA's commitment (provided in an attached resolution) is based upon successful award of the R&D grant and the private fundraising. No TICR funds are requested for property, but prototype equipment to be purchased with TICR funds are listed under contractual expenses. RCT states it has exclusive license to this technology, developed and recently filed for patents by Sonix Research of Annapolis MD, to increase the efficiency of combustion and reduce emissions in engines at significantly lower costs than competing technologies (the Sonix principal is an equity partner of the RCT team in exchange for the exclusive license). VA Tech has provided a letter indicating their confirmation of the technology opportunity and commitment to partner with RCT to conduct scale-up research. Commercialization outcomes are listed as 50 new jobs within five years in the RCTNG corporate headquarters that will locate in Tazewell and a \$4M investment in working capital, in addition to jobs with yet-to-be-identified local machine shops supplying the majority of equipment to RCT in the prototype and long-term manufacturing processes. Once again, the SVHEC Foundation proposes to use TICR funds as an investment in the company rather than a pass-through grant, with the Foundation and/or TICR receiving "rights to a return on investment – paid out of the Company's profit distributions." While matching funds are being raised **Staff recommends forwarding this proposal to the vetting process.**

University of Virginia

UVa-Wise / Micronic Technologies Water Field Pilot Program to Support Commercialization (#2872) **\$1,995,144.69 requested**

Executive summary provided by applicant: Micronic is a woman-owned Virginia small business established in November 2008 to develop, patent, and commercialize an advanced state-of-the-art water purification system. Since then, Micronic has developed MicroDesal™, a patented water-treatment technology that cleans water from any source cheaper and more efficiently and effectively than the competition. A relocation of its R&D operations to SWVA, partnering with UVa-Wise, scaling for manufacturing, and conducting field pilots for commercialization are components of this project. Approximately 12-15 high quality engineering and technical FTEs are planned in first 12 months, growing to 18-20 by year two, followed by 60-100 manufacturing jobs within 4-5 years.

Research and Development Opportunity

Myriad water pollution issues exist SWVA. Landfill leachate release toxins, requiring communities to truck it away for wastewater disposal, a costly solution. Acid mine drainage naturally occurs in the coalfields contaminating water with sulfuric acid and dissolved iron, precipitating orange sediments and dissolving heavy metals such as copper, lead, mercury into ground or surface water. Produced water from the oil and gas fields contains heavy contaminants and costs companies and communities heavily to treat, truck, and dispose. MicroDesal™ field pilots will validate water treatment and ready the technology for commercialization.

Proposed Research and Development

UVa-Wise and Micronic will collaborate on a field pilot testing program, including fabrication and field testing of two MicroDesal™ units to remove harmful contaminants from the indicated sources above and one major lab testing program. UVa-Wise will develop and host the water testing facility, conduct related testing and reporting, and publish results for third-party verification. Micronic will develop field pilots for

each of the pilot sites, including landfill leachate, acid mine drainage, and oil and gas wastewater. Outcomes include full testing and validation of the technology for commercialization.

Commercial Potential

Over 2500 landfills exist in the U.S. today and are growing, many of which produce leachate that is very costly to treat. More than 500,000 abandoned acid mines exist in the U.S. where states and local communities lack solutions. Finally, eight billion barrels of oil and gas produced wastewater is deep well injected that could be treated and released. This market will drive sales locally to solve regional water quality problems building a base for manufacturing. SWVA may well become a water research center of gravity for bringing high quality jobs to the region with associated high quality research.

Intellectual Foundation

On September 25, 2012, the USPTO issued Micronic Technologies its first patent (No. 8,273,165) for the core processor of system that establishes the technology's effectiveness. For its patent work, the Company has retained Cooley LLP, one of the nation's most respected for its intellectual property counsel. The Company's intellectual property strategy includes additional planning to protect its positioning in the market and that of future strategic partners. To that end, we will continue to support our current four patent-pending filings to ensure their issuance.

Staff comments and recommendation: Micronic Technologies (MT) is based in Northern VA and the company leadership has already made commitments to move to SWVA. An additional patent was filed for this product/process in July 2013. The request seeks funds for a two year project period to: establish a water testing lab with mass spectrometer, high resolution digital camera etc to be built at and operated by UVA-Wise; to contract with UVA-W faculty and students to conduct socio-economic and environmental impact analyses of the effects on flora and fauna of reintroducing MT's processed water to area waterways; for MT and UVA-W personnel (60% of funds or \$1.2M are requested for personnel), and within this category TICR is asked to pay \$917k for 50% of 12 MT staff (5 current MT employees to relocate to SWVA + 5-7 hires) to locate in a "planned R&D Center in Tazewell" and \$194k is requested to pay eight UVA-W faculty/staff and 12 student stipends to conduct the studies and operate the lab, travel, supplies etc. Requests for equipment total \$277k (\$113 to UVA-W and \$164 to MT, with MT equipment to be owned by UVW). Supplies/materials totals \$372 for MT and \$50k for UVA-W. Contractual and continuous costs make up the final requested \$96k. Matching funds have been approved for related tests being conducted in Delaware and elsewhere outside tobacco region, but no matching funds are committed yet for work within the tobacco region (a number of potential sources were listed). MT is in discussions with three SWVA localities regarding a location for their pilot facility. The proposal indicates 28 jobs by 2016 and 86-124 jobs by 2019. A \$200k private investment is listed in Outcomes although the company indicates it's capitalized at more than \$1M and has begun fundraising outreach to 250+ potential investors. This appears to be a product/process that has documented patents, funding support from the US Navy and USDA-SBIR for demonstrating proof of concept with the company's prototypes, and significant job creation potential for SWVA. Of the requested amount, \$569k will flow to UVA-W for the costs and purposes described above. TICR staff has significant concerns that this might be viewed as a new direction for use of R&D funds (providing substantial assistance to a university as well as the private beneficiary) and has had conversations with UVA-W staff on whether some of the requested studies (e.g. environmental and socio-economic) are critical to the commercialization, and what other sources of state funding might be available for the requested faculty salaries, student stipends and long-lived equipment in the testing lab. UVA-W has committed to further discussion/negotiation of those expenses, and in the meantime while that and private fundraising occurs **Staff recommends forwarding this proposal to the vetting process.**

Virginia State University

Pilot Sweet Sorghum-to-Syrup Infrastructure for Southside Virginia (#2866)

\$809,092 requested

Executive summary provided by applicant: This industry-driven research and development proposal will establish sweet sorghum as a cash crop in Southside Virginia. Ecology MIR-Group, a private firm, and Virginia State University (grantee) will research sweet sorghum varieties most suited to Southside conditions and establish agronomic requirements for sustainable production. Using sweet sorghum as feedstock, the project will pilot infrastructure for commercial scale production of food-grade sorghum syrup and develop markets for both the primary product (syrup) and secondary by-products (forage and bagasse). The project will benefit the Southside region through income diversification, job creation, and by acting as a catalyst for other industries.

Research and Development Opportunity

This project raises research questions both in the field and during postharvest handling. Information is not available on commercially available sweet sorghum varieties suited to Virginia, and field management practices for optimum production is inadequate. Necessary work will include identification of short season varieties that will produce a ratoon crop for forage, timing of field operations, and pest and disease interactions. There is also need for research on by-product (bagasse and press cake) value addition and utilization. Market research for primary and secondary products will be also be necessary as part of the commercialization effort.

Proposed Research and Development

We propose to expand ongoing sweet sorghum variety testing to include selected Southside locations. In addition to identifying varieties most suited to Southside VA conditions, the project will generate secondary agronomic data and make recommendations for sustainable production of sweet sorghum for syrup in the Southside. Postharvest research and development will include optimization of cane handling and processing, packaging and handling of syrup, by-product utilization and value addition, and market research.

Commercial Potential

There is a market for sorghum syrup in the US that we believe will continue to grow as people become more health conscious. This is because sorghum syrup is both a sweetener and excellent source of minerals and antioxidants. We possess the technology to process sorghum to syrup at commercial scale and Southside VA is a good location for growing, processing, and shipping sorghum syrup and associated by-products. Commercial sorghum production and processing will benefit the Southside region through agricultural investment and job creation. It will also contribute to enhanced research capacity at VSU, the grantee institution.

Intellectual Foundation

Ecology MIR-Group will use innovative protocols developed in central Asia, and owned by the company to process sorghum cane into syrup and biomass. In the US, we will use modified equipment from the sugarcane and maple syrup industry to generate a stable product with multiple uses. Sorghum is hardier than corn and has the advantage of yielding 1-1.5 crops a year in the southern U.S. Reports also show that sorghum has a net positive impact on soil carbon even where the whole plant is harvested. These premises will be verified and improved by our research and development effort.

Staff comments and recommendation: VSU requests funds to conduct three years of research on test sites in four Southern VA counties (Amelia, Dinwiddie, Nottoway & Sussex). TICR funds are requested to purchase a CASE-IH 8000 cane harvester (\$330k), a Ford F-150 pickup (\$30k), to build a shed to house the harvester at the processor's site in Dinwiddie (\$100k), for transfer payments to growers (\$75k),

supplies/materials (\$45k), contractual for harvesting and transportation (\$10k) and for VSU research personnel (\$274k). The majority of the request would use TICR funds to purchase capital assets such as the harvester, truck and shed, that will have useful life well beyond the three year research period, so TICR staff has inquired if lease options for the rolling stock have been explored. All matching funds (\$1.8M) are to come from the private partner's financing of a processing site that is proposed to be located in leased space in Dinwiddie. The proposal cites 77 new jobs, which appear to be 20 FTE and 50+ seasonal laborers with the private company and its supply chain. VSU has been testing sweet sorghum varieties at Randolph Farm, and the proposal cites the long history of growing and processing sweet sorghum in the Southeast US (Kentucky is a leading producer) as well as the company's sorghum experience in Europe. The objective of demonstrating plant suitability in the tobacco region as a step toward inducing growers to produce the feedstock for the private company is a project more typically seen in the TICR Agribusiness program (the proposal mentions grower income as an objective, which is the primary metric for the Agribusiness program). Similarly, there appears to be little in the way of research within the processing aspect of the project beyond well-known processes for producing syrup and some incremental research on using by-products as feed and fertilizer, which also appears to be generally-known. The private company provides evidence of committed private financing and buyers for their products, which are positive, so TICR staff has inquired if the company has discussed TROF and other incentives with Dinwiddie as viable inducements to secure the company's commitment to the tobacco region. Ultimately staff is of the opinion this proposal does not align well with the intent of the R&D program (e.g. the predominant use of TICR funds is to purchase long-lived assets that will benefit the private company), and can be considered within other TICR programs (Agribusiness and TROF) to achieve desired outcomes. **Staff recommends no further action on this proposal.**

VTI, LLC

Vehicle Modeling & Simulation Center Addition to the National Tire Research Center (#2865)

\$3,000,000 requested

Executive summary provided by applicant: The National Tire Research Center (NTRC) proposes to expand upon its economic development success in Southern Virginia by adding state-of-the-art vehicle modeling and driving simulation capabilities. NTRC's global customers must reduce vehicle production costs and timelines to remain competitive. The integration of NTRC's modeling and hardware-in-the-loop capabilities with high fidelity driving simulation creates an incomparable virtual design process. Relatedly, new vehicle technologies require human factors and transportation safety research using these one-of-a-kind tools. This will generate high paying, specialized jobs with minimal risk by further solidifying NTRC's emergence as a premier global vehicle technology and design center.

Research and Development Opportunity

Virtual development of vehicles is faster and more economical than physical prototyping. High fidelity simulation is the final step in prototype reduction, but the process of using simulation for virtual development is evolving. Research into processes, tools, and methods is needed before switching to a virtual development cycle. Relatedly, simulators serve as tools to supplement design and safety research conducted on-road or on-track, in an efficient and safe environment, particularly when hazards cannot be fully mitigated (e.g., impaired or automated driving). As technologies, laws and regulations evolve these tools continually increasing in importance for policy makers, regulators and manufacturers.

Proposed Research and Development

Like current NTRC facilities, the driving simulator will be created as a third-party service which global manufacturers and transportation researchers (including a local group) can use with only usage and support costs. The NTRC will supply advanced hardware-in-the-loop models to support driving simulations that replicate the ride, handling and performance of physical vehicles. The accurate replication of a vehicle will provide a level of fidelity that can support virtual vehicle development, human factors, and transportation safety research. Advanced software and state-of-the-art hardware will minimize visual/motion cueing disparities and allow for complex scenes and scenarios to maximize research and development opportunities.

Commercial Potential

Demand for virtual vehicle development and driving simulation research has never been greater. Armed with the proposed one-of-a-kind capabilities, the NTRC will be positioned to market services to its customers through consulting, customization fees, and facilities charges. The expansion of NTRC's offerings will generate additional annual revenue in excess of \$4M over the next eight years resulting in more than 35 new, direct jobs in the area. More importantly, the added synergy furthers NTRC's critical mass of facility and personnel capabilities, solidifying its role as a premier, world-class automotive design center, attracting new customers and related businesses to Southern Virginia.

Intellectual Foundation

Purchase of simulator includes licenses of software to run simulator. Licenses and IP for software are owned by the simulator manufacturer. As a 3rd party service provider no new intellectual property development is anticipated within the scope of this project. Customer IP may be integrated into the customer specific work, but will be owned by customer.

Staff comments and recommendation: The Virginia Tech Foundation, a 501C3, is the sole member of VTT, LLC and the applicants state this qualifies the LLC as an eligible entity to apply for TICR funds (alternatively the issue could be addressed by granting funds to the Foundation). The NTRC was previously awarded an R&D grant of \$5 million in October 2010. That test center has operated with two shifts since opening in 2013 and intends to add a third shift in 2014. This request exceeds the current maximum request amount of \$2 million, so if the Committee wishes to exceed the current maximum request and consider the requested amount, it should be noted as a one-time exception to policy. Alternatively staff has suggested to VTT that the \$1M difference between the requested amount and the current maximum request could be loaned to VTT and paid back to TICR from operating surpluses. The proposal seeks \$250k for personnel to set up and begin operations of the simulator and \$2.75 million to purchase the simulator (a price quote and detailed specifications for the 9 degrees-of-freedom simulator is attached to the proposal). Each expense would be matched dollar-for-dollar by an intended request to an automotive OEM for the required matching funds. All additional matching funds for site development and operations and are not yet committed and a specific site has not yet been selected to construct or upfit a building to house the simulator center (the applicant states it's awaiting TICR's funding decision). The proposal cites 40 full-time high-paying jobs by full operation in 2022. While matching funds and site selection are being addressed by the applicant, **Staff recommends forwarding this proposal to the vetting process.**